GOFC-GOLD
Regional Networks

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NASA MSFC

GOFC-GOLD

- Implementation Teams (IT)
  - Land Cover Characteristics and Change
  - Fire Monitoring and Mapping
- Working Groups (WG)
  - Working Group on Reducing Emissions from Deforestation and Forest Degradation (REDD)
  - Group on Biomass Monitoring
- Regional Networks
  - Interface between IT and regional data users

GOFC-GOLD 20th Anniversary, Georgia, 2017

GOFC-GOLD Regional Networks

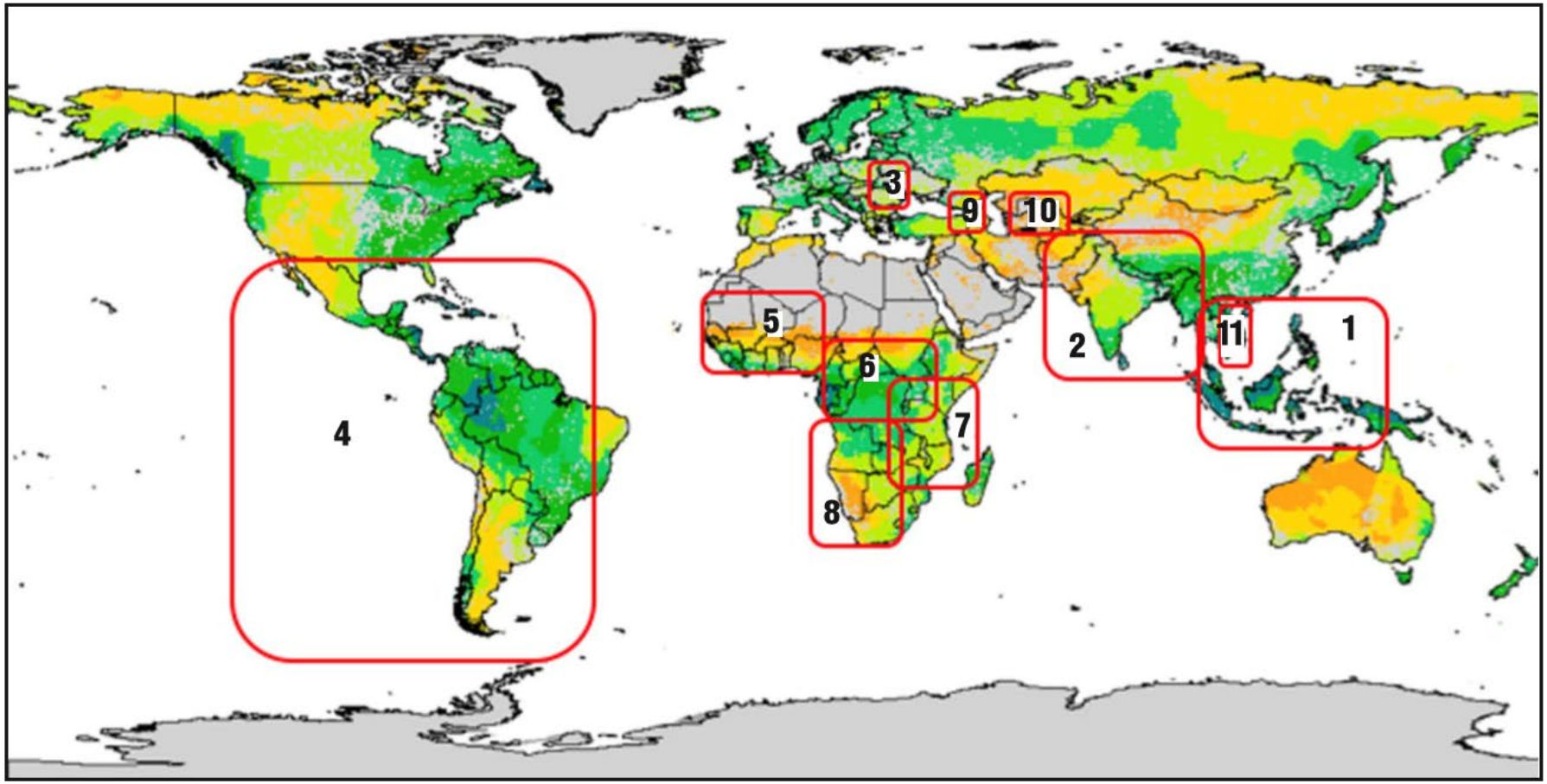

Figure 2. This map shows the currently active GOFC–GOLD RNs. 1. Southeast Asia Regional Research and Information Network (SEARRIN); 2. South Asia Regional Information Network (SARIN); 3. South Central European Regional International Network (SCERIN); 4. Red Latinoamerica de Teledeteccion e Incendios Forestales (RedLaTIF); 5. West African Regional Network (WARN); 6. Observatoire Satellital des Forets d'Afrique Central (OSFAC); 7. Miombo Network (MIOMBO); 8. Southern Africa Fire Network (SAFNET); 9. Central Asia Regional Information Network; 10. Caucasus Regional Information Network (CaucRIN); 11.Mekong Regional Information Network (MekRIN). See Table for a summary of the current and potential activities of each RN.

Summary of the GOFC–GOLD Twentieth-Anniversary Regional Networks Summit

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Introduction

Global Observation for Forest and Land Cover Dynamics (GOFC–GOLD) is a coordinated international program working to provide ongoing space-based and *in situ* observations of the land surface to support sustainable management of terrestrial resources at different scales. The GOFC–GOLD program acts as an international forum to exchange information, coordinate satellite observations, and provide a framework for and advocacy to establish long-term monitor-

Table. (cont.) List of GOFC RNs, their current research foci, and new opportunities. (See caption of accompanying Figure for expansion of RNs.) The information contained in this table summarizes content from presentations by a representative of each RN during the summit. The full presentations can be viewed at the URL referenced in the Introduction.

Regional Network	Current Foci	New Opportunities
SARIN	• Crop-type and -area mapping, and yield forecasting • Crop water-requirements analysis • Drought assessments and early warning • Agricultural fires and pollution mitigation • LCLUC with respect to agriculture • Capacity-building and training activities with respect to remote sensing of agriculture and water resource	• Strengthening regional contacts in the region • Capacity building specific to agriculture and water resources • Evaluating, testing, and validating different LCLUC algorithms
SAFNET	• Providing satellite fire data products • Remote-sensing-based capacity building and training • Validating new satellite fire products • Supporting national and regional fire-policy development • Refining fire service—developed as a part of Monitoring for Environment and Security in Africa (MESA) • Refining Advanced Fire Information Systems (AFIS), useful for near-real-time fire monitoring	• Field validating satellite fire products • Developing fire danger rating training for the region • Enhancing MESA fire services • Engaging more academic institutions in the region
CaucRIN *	• Developing land-cover maps for the entire Caucasus region • Focusing on forest and agricultural LCLUC issues • Performing regional whole-basin LCLUC assessment for Kura River • Conducting planned meeting and training activities—including developing a web portal	*Not Applicable* (Newly formed network)
MekRIN **	• Focusing on the water, food, and energy nexus • Addressing drivers, processes and impacts linking LCLUC to dams in the Mekong region	*Not Applicable* (Newly formed network)
SCERIN	• Assessing forest changes: e.g., disturbances, biomass production, forest LCLUC, and driving forces • Assessing LCLUC and climate change • Validating and verifying data products to support current and future satellite missions • Conducting LCLUC water management (i.e., in watersheds, catchments, dams)	• Addressing LCLUC specific to land abandonment and urban expansion • Validating and verifying regional LCLUC methods and products
RedLATIF	• Characterizing fires using remote sensing • Quantifying agricultural fires and emissions • Addressing lightning fires and their impact • Assessing specific LCLUC impacts on deforestation	• Building expertise in Earth observations data processing and validation • Generating cloud-processing-based fire data products
WARN	• Satellite remote sensing of fires • Calibrating and validating fire products • Quantifying fire emissions	• Examining LCLUC relating to slash-and-burn agriculture • Performing agricultural land-use-change studies

continued on page 34

- *Of the 11 networks, 6 networks showing interests in Fires*

- SAFNET
- RedLATIF
- SEARRIN
- SARIN
  - *WARN*
  - *Miombo*

GOFC-GOLD Website Update

GOFC-GOLD FAO website - very old info – not actively updated) - (contacted Dough Muchoney and shut it down)

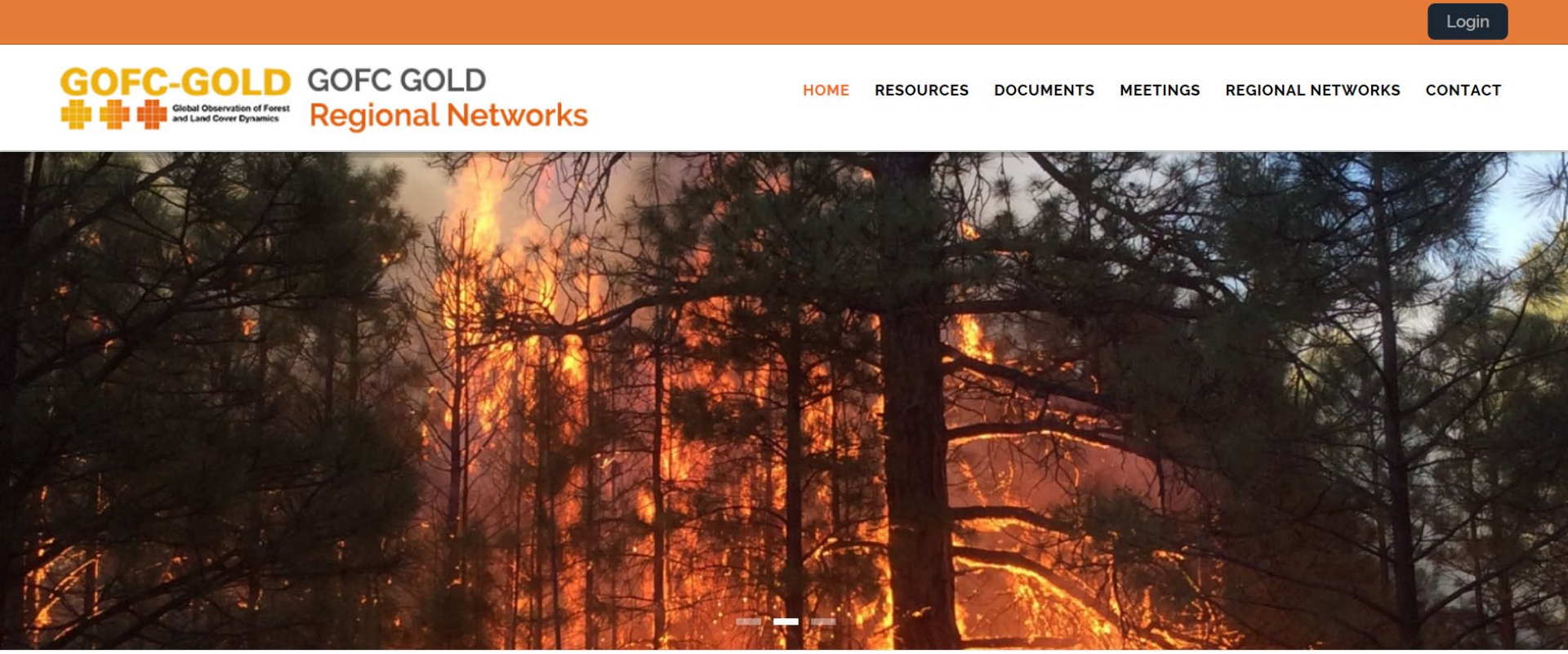
GOFC-GOLD – Fire-IT website – www.gofc-fire.umd.edu

GOFC-GOLD – Land Cover IT website – http://www.gofcgold.wur.nl/

GOFC-GOLD – START website - https://start.org/programs/gofc-gold/

Regional Networks Information is being posted at GOFC-GOLD Fire website;

Consistency is needed !

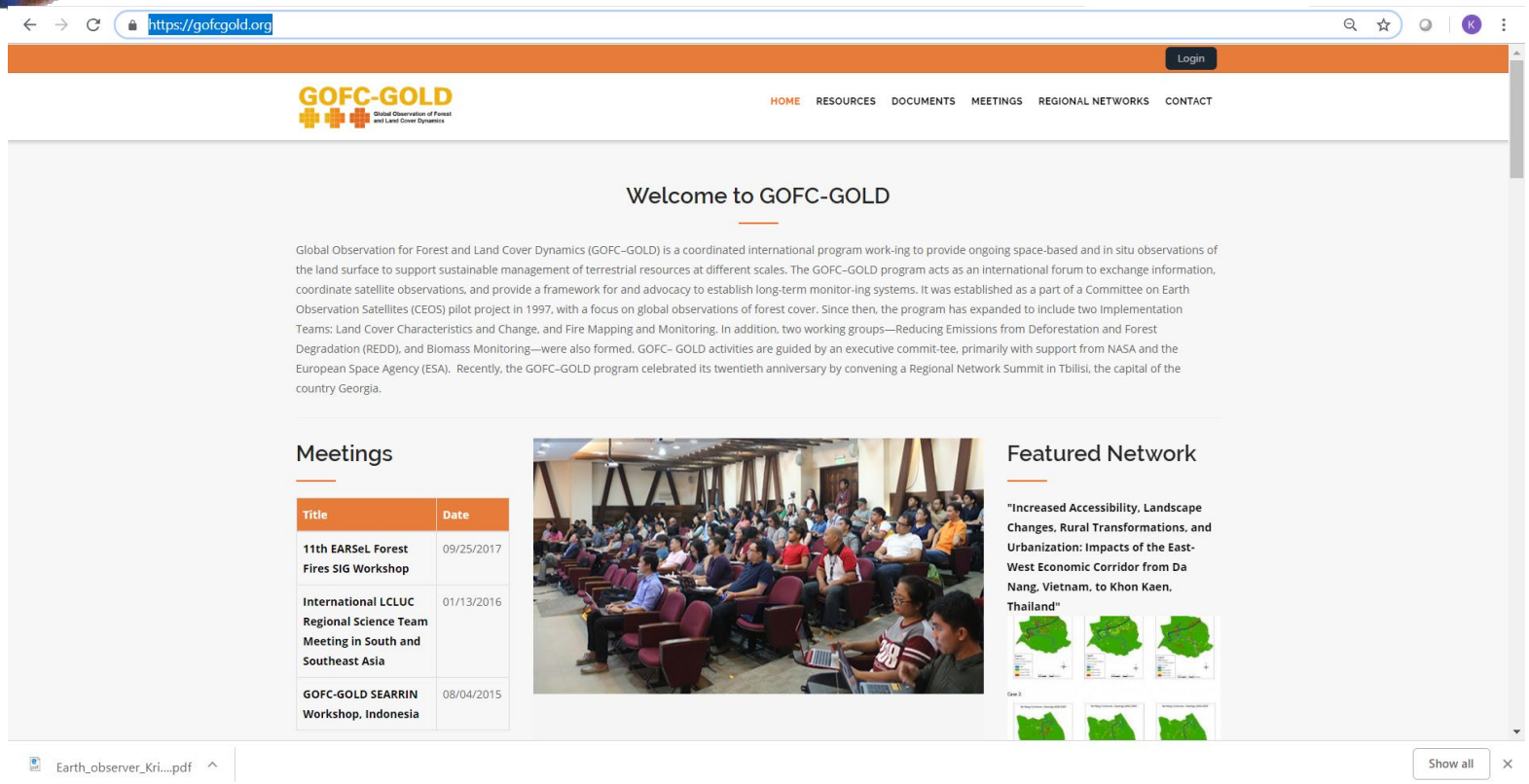


New GOFC-GOLD Website being Developed

https://gofcgold.org/

(Domain name already purchased)

https://gofcgold.org/



-It will have Land, Fire and Regional Network Information / Links at one site

Major change w.r.t. Regional Networks – All RN leads will have access to update their own Network Pages Directly !

Updates from SEARRIN and SARIN

- *Both network researchers are represented in the annual + thematic meetings of South/Southeast Asia Research Initiative (SARI) – LCLUC*

- *Due to funding issues, we are combining events under one umbrella.*

- *Dedicated Fires/Biomass Burning sessions involving Regional Scientists for 1.5-days;*

- *Funding is for mostly Meetings + Trainings through JAXA – NIES (since 7-years and will continue)*

Quezon city, Philippines

28-30th May, 2018

200-participants
3-day meeting with sessions on LCLUC, Agriculture and Land-Atmopsheric Interactions

1.5-day - Land Atmospheric Interactions – Parallel sessions

3-day training with 100-participants
(31 May + 1, 2nd June)

Local Host

University of Philippines
Institute of Environmental Science and Meteorology

Sponsors and Partners

NIES JAPAN
GOFC-GOLD GLOBAL OBSERVATION FOR FOREST AND LAND COVER DYNAMICS
UNIVERSITY OF MARYLAND
NASA
SERVIR
SARI
EOFSAC
GEOGLAM Global Agricultural Monitoring
Asia-RiCE Crop Estimation and Monitoring
START global change SysTem for Analysis, Research & Training
APN ASIA-PACIFIC NETWORK FOR GLOBAL CHANGE RESEARCH
ILLINOIS UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
NARIT
JAXA
adpc
CESBIO
VNSC Liftoff your Dream

Brief History of INSAT Satellites

- **Satellite Meteorology in IMD really started in 1982 with the launch of INSAT-1A which was a multipurpose satellite meant for services to Meteorology, Television and Communication. Before that , Indian meteorologists were using analog imageries received from U.S. Polar orbiting satellites series of TIROS-N.**
- **Many satellites for meteorological purposes were launched after the launch of INSAT-1A as given below:**

- **INSAT-1A – 10 April 1982**
- **Two Channel VHRR**
- **INSAT-1B – 30 August,1983**
- **INSAT-1C – 21 July 1988**
- **INSAT-1D – 12 June,1990**
- **INSAT-2A – 10 July, 1992**
- **INSAT-2B – 23 July,1993**
- **INSAT-2E – 03 April 1999** **Three Channel VHRR**
- **KALPANA-1 – 12 Sept.2002**
- **INSAT-3A – 10 April 2003**
- **INSAT-3D – 25 July, 2013**
- ***INSAT-3D – 26 July,2013 --- 6 channel imager and 19 channel sounder***

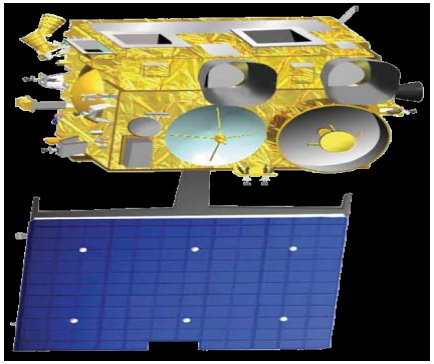
C-Band Transponders mainly for communication

Some with Meteorological Observations

INSAT-3D - India's Advanced Weather Satellite

India's advanced weather satellite INSAT-3D was launched in the early hours of July 26, 2013 from Kourou, French Guyana, and has successfully been placed in Geosynchronous orbit.

It carries four payloads



- **Imager (Six Channels)**
- **Sounder (Nineteen Channels)**
- **Data Relay Transponder(DRT)**
- **Satellite Aided Search and Rescue**

Most of the products are ingested by Indian Meteorological Department (IMD) - National Centre of Medium Range Weather Prediction (NCMRWF).

European Center of Medium range Weather Forecast (ECMWF) and United Kingdom Meteorological Office (UKMET) use INSAT-3D derived atmospheric winds in their global models.

Imager (Six Channels)

Spectral Band	Wave-length(μm)	Ground Resolution
Visible	0.55-0.75	1 km
SWIR	1.55-1.70	1 km
MIR	3.80-4.00	4km
WV	6.50-7.10	8km
TIR1	10.2-11.3	4km
TIR2	11.5-12.5	4km

Generates images of the earth disk in every 26 minutes

INSAT-3D Sounder Channels Characteristics						
Detector	Ch. No.	l_c (mm)	n_c (cm^{-1})	NE∆T @300K	Principal absorbing gas	Purpose
Long wave	1	14.67	682	0.17	CO_2	Stratosphere temperature
	2	14.32	699	0.16	CO_2	Tropopause temperature
	3	14.04	712	0.15	CO_2	Upper-level temperature
	4	13.64	733	0.12	CO_2	Mid-level temperature
	5	13.32	751	0.12	CO_2	Low-level temperature
	6	12.62	793	0.07	water vapor	Total precipitable water
	7	11.99	834	0.05	water vapor	Surface temp., moisture
Mid wave	8	11.04	906	0.05	window	Surface temperature
	9	9.72	1029	0.10	ozone	Total ozone
	10	7.44	1344	0.05	water vapor	Low-level moisture
	11	7.03	1422	0.05	water vapor	Mid-level moisture
	12	6.53	1531	0.10	water vapor	Upper-level moisture
Short wave	13	4.58	2184	0.05	N_2O	Low-level temperature
	14	4.53	2209	0.05	N_2O	Mid-level temperature
	15	4.46	2241	0.05	CO_2	Upper-level temperature
	16	4.13	2420	0.05	CO_2	Boundary-level temp.
	17	3.98	2510	0.05	window	Surface temperature
	18	3.76	2658	0.05	window	Surface temp., moisture
Visible	19	0.695	14367	-	visible	Cloud

19 channel Sounder, with 18 narrow spectral channels in short-wave infrared, middle infrared and long wave infrared regions and one channel in the visible region; Signals every 1-hour

Satellites for Greenhouse Gases Observation (Column observations)

Mission	Country / Organization	Period	GHGs	Comments
ENVISAT / SCIAMACHY	ESA	2002 -2012	CO2, CH4	
GOSAT	Japan	2009 -	CO2, CH4	FTS
OCO-2	US	2014 -	CO2	Grating
GHGSat-D/CLAIRE	GHGSat (Canada)	2016 -	CO2, CH4	Fabry–Pérot
TanSat	China	2016 -	CO2	Grating
Sentinel-5p / TROPOMI	EC	2017 -	CH4	
FY-3D / GAS	China	2017 -	CO2, CH4	
GF-5 / GMI	China	2018 -	CO2, CH4	Spatial Heterodyne
GOSAT-2	Japan	FY2018 -	CO2, CH4	FTS
ISS / OCO-3	US	2019 -	CO2,	Grating
MicroCarb	France	2021 -	CO2	
MERLIN	France/ Germany	2021 -	CH4	Laser
GeoCARB	US	2022-	CO2, CH4	Geostationary, Grating
GOSAT-3	Japan	2022 -	?	?
Sentinel 7	(EC)	2025 -	CO2	Constellation

Almost 10-years of continuous CO2 data

sources.

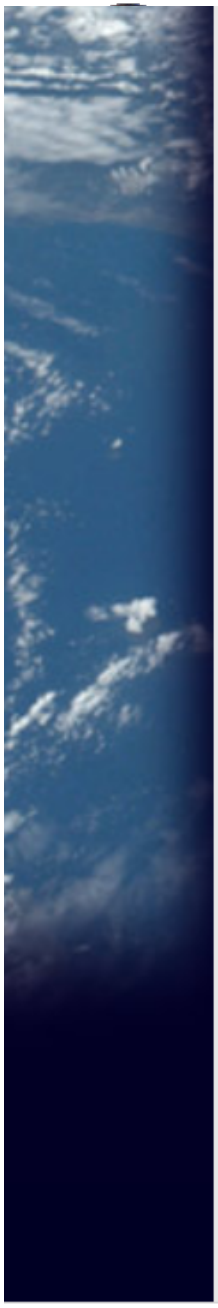
Item	GOSAT-2	GOSAT
Observed greenhouse gases	CO_2, CH_4, O_3, H_2O, CO, NO_2	CO_2, CH_4, O_3, H_2O
Instruments	1. FTS (Fourier Transform Spectrometer) 2. Imager	1. FTS 2. Imager
LTAN (Local Time on Ascending Node)	13:00 ± 0:15 hr	13:00 ± 0:15 hr
Orbital altitude	613 km	666 km
Revisit time	3 days (may be increased)	3 days
TANSO-FTS (Thermal And Near infrared Sensor for carbon Observation - Fourier Transform Spectrometer)		
Coverage	Cross-track: ±35°, Along-track: ±40°	Cross-track: ±35°, Along-track: ±20°
Sampling	About 160 km interval, (5 points in the CT)	About 160 km interval
IFOV	10.5 km	10.5 km
Spectral ranges	1) 0.75-0.77 μm, 12,900-13,200 cm^{-1} (P/S) (O_2A) 2) 1.59-1.67 μm, 6,000-6,300 cm^{-1} (P/S) (CO_2,CH_4) 3) 2.04-2.08 μm, 4,800-4,900 cm^{-1} (P/S) (CO_2) 4) 2.33-2.38 μm, 4,200-4,300 cm^{-1} (CO) 5) 5.5-14.3 μm, 700-1,800 cm^{-1} (CO_2,CH_4,O_3)	1) 0.75-0.77 μm, 12,900-13,200 cm^{-1} (O_2A) 2) 1.59-1.67 μm, 5,800-6,400 cm^{-1} (CO_2,CH_4) 3) 2.04-2.08 μm, 4,800-5,200 cm^{-1} (CO_2) 4) 2.33-2.38 μm, 700-1,800 cm^{-1} (CO_2,CH_4,O_3)
Sampling duration	4 s	4 s
Function	Intelligent pointing	-
Spectral resolution	0.2 cm^{-1}	0.2 cm^{-1}
SNR	>400 (Band 1) >300 (Band 2 to 5) @SZA=30°, albedo=0.3)	>300
TANSO-CAI (Thermal And Near infrared Sensor for carbon Observation - Cloud and Aerosol Imager)		
Spectroscopic System	Band pass filter and grating	Band pass filter
Spectral ranges	1) 322-450 nm (1 nm step) 2) 664-684 nm (eliminated ?) 3) 860-880 nm (eliminated ?) 4) to be eliminated	1) 370-390 nm 2) 664-684 nm 3) 860-880 nm 4) 1555-1645 nm

GOSAT-2

Improved re-visit time
to 3 days (from 6-days)

Improved resolution TANSO cloud imager

Band 1-3: 500 m,
Band 4: 1500 m,



Mission requirements	GOSAT	GOSAT-2
Uncertainty reduction of the future forecast		
1. Concentration measurement precision	4 ppm (CO_2) 34 ppb (CH_4) Observational period: 3 month - 1,000 km mesh (terrestrial region)	0.5 ppm (CO_2) 5 ppb (CH_4) Observational period: 1 month - 500 km mesh (terrestrial region) - 2,000 km mesh (ocean)
2. Estimation accuracy of flux	Reduce the estimation error on the sub-continental scale to half compared with the one estimated using only ground observation data	Estimate the monthly net fluxes with the accuracy of ±100%. Use of 1,000 km mesh (terrestrial region) and 4,000 km mesh (ocean)
Monitoring of greenhouse gas emissions		
3. Expansion of the observation gases	-	Examine the feasibility of the calculation of the anthropogenic emission with the observation of the correlated material such as CO and NO_2
4. Improvement of the natural emission estimation accuracy	(Chlorophyll Fluorescence observation as a result)	Investigate the correlation between the distribution of greenhouse gases and the vegetation activity

Table 1: Observational requirements for the GOSAT and GOSAT-2 missions

Land Cover/Land Use Changes and Impacts on Environment in South/Southeast Asia, Metro Manila, Philippines

Updates of Seven South East Asian Studies (7-SEAS)

George Lin, Tang-Huang Lin*
, National Central U.,
Si-Chee Tsay, Brent Holben, Hal Maring,
Christina Hsu, NASA/GSFC
Jeff Reid, Naval Research Lab,
7-SEAS team of TH/TW/VN

7-SEAS activities since 2007

- **11 workshops and training courses**
- **2007 VBBE (Virtual BB Experiment)**
- **2012 Cruise mission in southern SE Asia**

In-situ Experiments in northern SE Asia:

Phase I (2010-2012)

- 2010 Dongsha Experiment
- 2011 Son La Campaign I
- 2012 Son-La Campaign II

Phase II (2013-2015)

- 2013 BASELInE I
- 2014 BASELnE II
- 2015 BASELInE III

Phase III (2016-2018): Data analysis and network

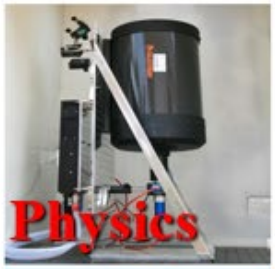
7-SEAS Instrumentation

Toxin Chemistry
- ❑ mass concentration
- ❑ Dioxin
- ❑ Metal
- ❑ PAHs

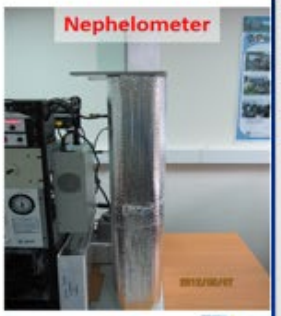
Mercury Chemistry
- ❑ mass concentration
- ❑ gaseous mercury
- ❑ particulate mercury

Aerosol Chemistry
- ❑ mass concentration
- ❑ water soluble ions
- ❑ carbon composition
- ❑ levoglucosan

CCN



Lidar



Meteorological data

AOD、Radiation

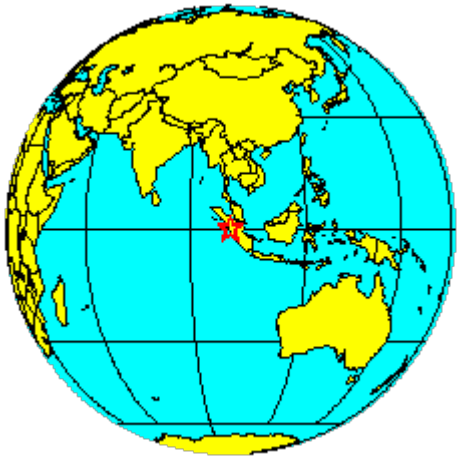
氣膠吸光及散光係數

NASA COMMIT- Dongsha, Son La
NASA ACHIEVE Yen Bai
NCU mobile 1 - Doi Ang Khang
NCU mobile 2 – Hengchun
NCU Mt. Lulin Dongsha supersites

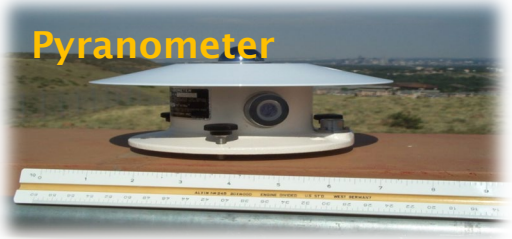
Air quality mobile - Hengchun

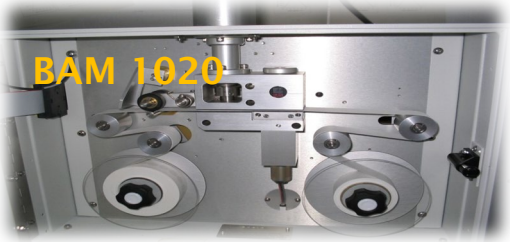
GHG measurement data in a GAW Station in Indonesia (in Bukit Koto Tabang, West Sumatera, Indonesia)

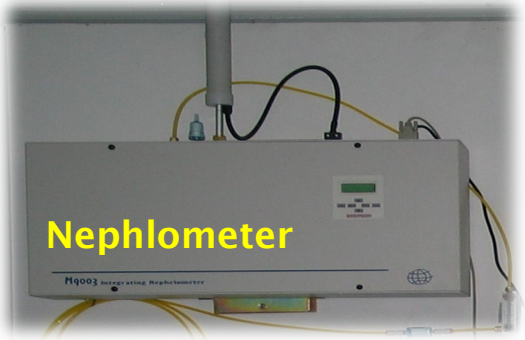
West Sumatera



2014-2018



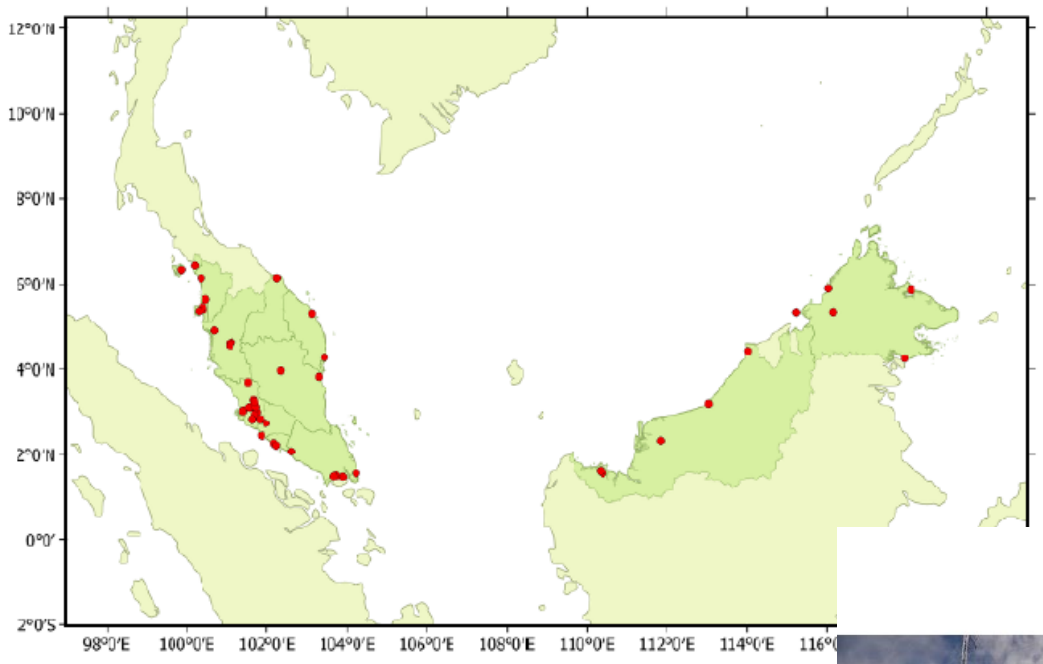




GHG measurements – 52 Monitoring Stations in Malaysia

Air Monitoring Station

Continuous Air Quality Monitoring System (CAQM)



ASMA Air Monitoring Station

Air Quality Monitoring Network

*ASMA = Alam Sekitar Malaysia

Chiang Mai, Thailand

Consistent and year-long mixing layer height measurements with LiDAR in the mountain valley of Chiang Mai

AERONET AOD Datasets

Country	Total station	Urban stations	Rural stations	Detail
Taiwan	7	5	2	Chen-Kung_Univ, Lulin, Douliu, Douliu, Douliu, EPA-NCU, Taipei_CWB
Indonesia	6	3	3	Bandung, Jambi, Makassar, Makassar, Palangkaraya, Pontianak
Laos	2	1	1	Luang_Namtha, Vientiane
Malaysia	2	2	0	Kuching, USM_Penang
Philippines	3	1	2	El_Nido_Airport, Manila_Observatory, ND_Marbel_Univ
Singapore	1	1	0	Singapore
Thailand	5	3	2	Chiang_Mai_Met_Sta, GOT_Seaprism, Songkhla_Met_Sta, Silpakorn_Univ, Ubon_Ratchathani
HongKong	1	1	0	Hong_Kong_PolyU
Vietnam	4	1	3	Bac_Lieu, NGHIA_DO, Son_La, NhaTrang

3-new stations; Dibrugarh, North East India; and Calicut, Kerala, Mandalay, Myanmar

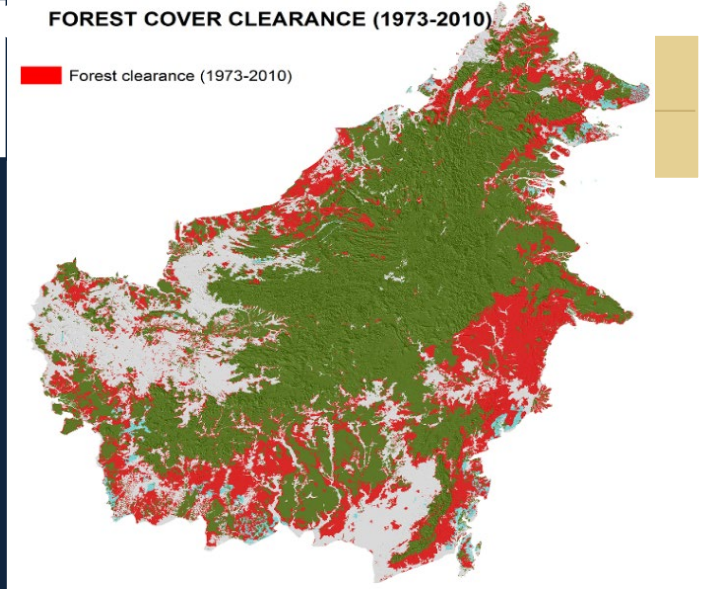
School of Earth and Environment
INSTITUTE FOR CLIMATE & ATMOSPHERIC SCIENCE

UNIVERSITY OF LEEDS

Impact of Indonesian fires on air quality in Equatorial Asia between 2002 and 2015

Laura Kiely [1], Dominick Spracklen [1], Stephen Arnold [1], John Marsham [1], Carly Reddington [1], Luke Conibear [1], Christoph Knote [2], Mikinori Kuwata [3], Sri Hapsari Budisulistiorini [3]

1. Institute of Climate and Atmospheric Studies, University of Leeds; 2. Ludwig-Maximilians University, Munich; 3. Nanyang Technological University, Singapore



WRF-Chem modelling -
GFED peat emissions could be underestimated by a factor of 3

Next SARI - South + Southeast Asia GOFC networks meeting in Malaysia

22-24th July 2019 (meeting)

25-27th July, 2019 (training)